REMARKS

Reconsideration and allowance are respectfully requested.

Before entry of this amendment, claims 3-11, 36-39, 72-74, 102-106 and 109-114 were pending. Claims 109-114 were withdrawn. In the Office Action, claims 3-11, 36-39, 72-74 and 102-106 were rejected. In the present amendment, no claims are canceled, added or amended. After entry of the amendment, claims 3-11, 36-39, 72-74, 102-106 and 109-114 are pending.

I. Claims 3, 8-11, 36, 39, 74, 102-105

Claims 3, 8-11, 36, 39, 74 and 102-105 are rejected under 35 U.S.C. §103(a) as being unpatentable over Nariani et al. (US Patent No. 5,470,775) in view of Jacobs (US Patent No. 4,240,196) and in further view of Bencher et al. ("Dielectric Antireflective coatings for DUV Lithography", Solid State Technology, March 1997, p. 109) (Office Action, p. 2, lines 10-14). Applicants respectfully disagree and traverse the § 103(a) rejection.

To established a *prima facie* case of obviousness, the Examiner must demonstrate three criteria. The MPEP § 706.02(j) states:

> "To establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. . . . 'To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references.' Ex parte Clapp, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985)." MPEP § 706.02(j) (emphasis added).

The combination of Nariani, Jacobs and Bencher does not form the basis for a valid rejection of independent claims 3, 36 and 103 under § 103(a) for at least two reasons. First, the references when combined do not teach or suggest all of the claim elements. Second, there is no suggestion or motivation in Bencher to combine the teachings of Bencher with the combined teachings of Nariani and Jacobs. Nor is there any suggestion or motivation in Nariani or Jacobs to combine their teachings with Bencher.

A. Independent claims 3, 36 and 103

Each of independent claims 3, 36 and 103 recites (i) a dielectric layer disposed in the inter-electrode region or between a top electrode and a conductive layer, and (ii) a conformal insulating layer filled, provided or formed in an inter-electrode region or in an undercutting. Claim 3 recites, in part, "subsequently forming a conformal insulating layer over a portion of said exposed portion of said lower electrode layer proximate to said portion of said dielectric layer disposed in said inter-electrode region, whereby a portion of conformal insulating layer is formed in said inter-electrode region" (emphasis added). Claim 36 recited, in part, "forming a conformal insulating layer over said capacitor structure and a portion of said conductive layer proximate to said capacitor structure, wherein a portion of said conformal insulating layer is formed in an inter-electrode region within said lateral boundary of said top electrode and between said top electrode and said conductive layer" (emphasis added). Claim 103 recites, in part, "providing a conformal insulating layer over said upper electrode and over said exposed portion of said lower electrode layer such that said undercutting is filled in by said conformal insulating layer" (emphasis added).

(i) all of the claim elements are not taught or suggested.

The Examiner admits that "Nariani does not explicitly teach a portion of the dielectric layer is removed from the inter-electrode region, subsequently forming a conformal insulating layer . . ." (Office Action, page 3, lines 7-9).

Bencher does not teach removing a portion of a dielectric layer from an inter-electrode region. Jacobs does not teach removing a portion of a dielectric layer from an inter-electrode region. Therefore, none of Nariani, Jacobs or Bencher teaches removing a portion of a dielectric layer from an inter-electrode region.

In addition, none of Nariani, Jacobs or Bencher teaches a conformal insulating layer filled, provided or formed in an inter-electrode region or in an undercutting. So the Examiner relies on multiple references for the teaching of even individual claim limitations. The Examiner relies on Jacobs for teaching an inter-electrode region or an undercutting. The Examiner states:

> "Jacobs teaches in figure 2 that undercutting of an oxide layer 12 underneath a polysilicon layer 14 occurs during standard (conventional) etching and processing of the layers. Thus, Jacobs teach that an undercut necessarily occurs in the oxide beneath the polysilicon. This teaching applied to the process of Nariani teaches that Nariani would necessarily remove a portion of the dielectric layer from the inter-electrode region when using conventional processing. Thus, though Nariani does not explicitly disclose removing a portion of the dielectric layer from the inter-electrode region, Nariani does teach this limitation since this would necessarily occur in their process" (Office Action, page 3, line 16 – page 4, line 2) (emphasis added).

> "Nonetheless, as taught by Jacobs, the dielectric layer in an inter-electrode region would be undercut in the conventional process used by Nariani, thus Nariani implicitly teaches this limitation. Also, as explained above, it would have been obvious to use the conformal insulating layer of Nariani in the method of Jacobs" (Office Action, page 6, lines 3-6) (emphasis added).

Thus, the Examiner argues that, although Nariani does not teach removing a portion of a dielectric layer, Nariani would necessarily remove the dielectric layer from an inter-electrode region because Jacobs teaches that undercutting necessarily occurs in an oxide beneath polysilicon. In addition, the Examiner states, "Jacobs further teach in figure 3 forming a conformal insulating layer 18/20 is formed over the structure wherein a portion of the conformal insulating

layer 18/20 is formed in the undercut region" (Office Action, page 4, lines 3-5). Applicants respectfully disagree. First, Jacobs does not teach undercutting into a dielectric layer, and undercutting the dielectric layer of Nariani would not necessarily occur. Second, Figure 3 of Jacobs does not teach forming a portion of a conformal insulating layer in an undercutting.

The Examiner admits that Nariani does not teach removing a dielectric layer to form an undercutting. The Examiner instead argues that Nariani would necessarily remove a portion of a dielectric layer in an inter-electrode region because undercutting necessarily occurs in "standard (conventional) etching" (Office Action, page 3, line 17). But Jacobs does not teach etching a dielectric layer. Jacobs does not teach that its method can be used to make capacitors. Jacobs does not teach that its buffered hydrofluoric acid etching step would etch a dielectric layer in the same way that the oxide layer 12 is etched. Jacobs does not teach that oxide layer 12 is both a dielectric layer and a conformal insulating layer.

Figure 3 of Jacobs teaches that the regions labeled 12,16, 18 and 20 are oxide layers. Oxide layer 12 lies between a substrate 10 and a polysilicon layer 14. Oxide layer 16 is disposed on top of polysilicon layer 14. Jacobs teaches that it is oxide layer 12 that is removed to form the undercutting. Jacobs teaches that "by compensating for the undercutting of the oxide layer 12, applicants were thereby able to devise an advantageous fabrication sequence . . . which does not exhibit the low-voltage-breakdown regions . . ." (Jacobs, col. 4, lines 18-22) (emphasis added). Then the structure is reoxidized and additional oxide is formed. For example, polysilicon layer 14 is also surrounded on the right-hand side by an oxide layer 20 and on the top by an oxide layer 16. The polysilicon layer 14 of figure 3 is surrounded on all sides by the same material: the oxide labeled 12, 16, 18 and 20. Thus, the oxide layers labeled 12,16, 18 and 20 cannot be both a dielectric layer disposed in an inter-electrode region, as well as a conformal insulating layer formed in the inter-electrode region. As a consequence, Jacobs cannot teach both (i) removing a portion of a dielectric

layer from an undercutting and (ii) forming an insulting layer in the undercutting. Claims 3, 36 and 103 recited both a dielectric layer and a conformal insulating layer. These limitations cannot be taught by the same element of a reference, i.e., the oxide labeled 12,16, 18 and 20.

Finally, each of claims 3, 36 and 103 recites a conformal insulating layer. The oxide of layers 12, 16, 18 and 20 of Jacobs is not conformal because the oxide is also disposed between substrate 10 and polysilicon layer 14.

(ii) no suggestion or motivation to combine.

The Examiner admits that "Nariani with Jacobs are silent to teaching forming an anti-reflective layer (ARL) over at least a portion of the conformal insulting layer" (Office Action, page 4, lines 14-15). The Examiner argues that "[i]t would have been obvious to one of ordinary skill in the art at the time of the invention to use the antireflective layer of Bencher in the method of Nariani and Jacobs in order to improve the photolithographic process by reducing net linewidth variations as is well known in the art" (Office Action, page 4, lines 18-21).

Applicants contend that no line of reasoning would lead to a motivation to perform various step of Nariani and Jacobs in order to prevent a problem from occurring that results from performing a step of Bencher. Applicants' inventions include the discovery of the source of a problem, namely that the existence of undercutting increases leakage current through an anti-reflective layer (ARL) from one capacitor plate to another. The ARL is taught by Bencher. Jacobs recognizes a different problem and solves that problem in a different way.

Jacobs does not recognize the problem of leakage through an ARL between capacitor plates. In fact, Jacobs does not recognize the problem of leakage between capacitor plates. Instead, Jacobs recognizes that as a result of undercutting, there is a breakdown in an oxide layer (i) between the polysilicon layer 22 and the substrate 10, or (ii) between the polysilicon layer 22 and the polysilicon layer 14. Neither of these breakdowns results in a leakage current between capacitor plates. Jacobs solves the problem it recognizes in a way

other than by forming a conformal insulating layer in an inter-electrode region. In Jacobs, the breakdowns occur in the oxide layers, which the Examiner argues constitute the conformal insulating layer. Forming the oxide layers does not solve the breakdown problem. Instead, the problem recognized by Jacobs is solved by removing the overhang that results from undercutting. Jacobs states:

> "In accordance with the principles of applicants' invention, the overhang of the polysilicon layer 14 (FIG. 2) is removed prior to the aforedescribed reoxidation step. This is done by means of any suitable dry or wet etching technique that is capable of removing doped polysilicon but that is relatively ineffective in removing silicon dioxide" (Jacobs, col. 4, lines 24-30).

Therefore, Jacobs teaches away from solving the problem of leakage between capacitor plates by forming a conformal insulting layer in an inter-electrode region. According to the teachings of Jacobs, leakage between capacitor plates would be solved by removing an overhang of a top electrode instead of by leaving the oxide layers through which a breakdown occurs, as recognized by Jacobs. Jacobs creates no reasonable expectation that forming a conformal insulating layer in an inter-electrode region from which a dielectric has been removed would lead to success in reducing leakage between capacitor plates.

The motivation mentioned by the Examiner is not a motivation to combine Bencher specifically with Nariani and Jacobs, but rather is only a motivation to combine Bencher with references that seek to solve the problem of reducing variations in net linewidths. That problem is not peculiar to a hypothetical combination of Nariani and Jacobs. One of ordinary skill in the art, who was confronted with the problem of reducing net linewidth variations, would not have been motivated to combine Bencher with one particular reference any more than with a myriad of other references. And there would have been no particular motivation to combine Bencher with the hypothetical combination of Nariani and Jacobs. To the contrary, there is not indication that reducing linewitdth variations is a major consideration when fabricating capacitors. There is also no

suggestion that reducing net linewidth variation is a primary consideration in solving the problem of capacitor leakage.

Finally, one of ordinary skill in the art given the hypothetical combination of Nariani and Jacobs would not even have been confronted with the problem of leakage between capacitor plates because the capacitor leakage occurs through the anti-reflective layer of Bencher. As explained above, Jacobs does not teach the problem of breakdown of the oxide layers between capacitor plates. In Jacobs, the breakdown in an oxide layer occurs (i) between the polysilicon layer 22 and the substrate 10, or (ii) between the polysilicon layer 22 and the polysilicon layer 14. It is improper for the Examiner to base a *prima facie* case of obviousness on a motivation to combine a last reference (Bencher) with a combination of references (Nariani and Jacobs) where the motivation to form the combination of references would not have arisen without the last reference. To do so impermissibly defines the problem in terms of its solution. Defining the problem in terms of its solution reveals improper hindsight in the selection of the prior art relevant to obviousness. The motivation to form a conformal insulating layer in an inter-electrode region from which a dielectric has been removed would not have existed without capacitor leakage caused by a step of Bencher.

Because the combination Nariani, Jacobs and Bencher does not disclose all of the elements of claims 3, 36 and 103, and furthermore because there is no suggestion or motivation to combine Bencher with Nariani and Jacobs even if all of the elements were present, Nariani, Jacobs and Bencher do not form the basis for a valid rejection under § 103(a). Reconsideration of the § 103(a) rejection and allowance of claims 3, 36 and 103 is requested.

B. Dependent claims 8-11, 74 and 102

Claims 8-11, 74 and 102 depend directly or indirectly from claim 3. Applicants respectfully submit that claims 8-11, 74 and 102 are allowable for at least the same reasons for which claim 3 is allowable. Allowance of claims 8-11, 74 and 102 is requested.

C. Dependent claim 39

Claim 39 depends from claim 36. Applicants respectfully submit that claim 39 is allowable for at least the same reasons for which claim 39 is allowable. Allowance of claim 39 is requested.

D. Dependent claims 104-105

Claims 104-105 depend from claim 103. Applicants respectfully submit that claims 104-105 are allowable for at least the same reasons for which claim 103 is allowable. Allowance of claims 104-105 is requested.

II. Claims 4-7, 37-38 and 106

Claims 4-7, 37-38 and 106 are rejected under 35 U.S.C. §103(a) as being unpatentable over Nariani, Jacobs and Bencher in further view of Wang et al. (USP 5,545,585). (Office Action, page 10, lines 5-8) Applicants respectfully disagree and traverse the § 103(a) rejection.

The combination of Nariani, Jacobs, Bencher and Wang does not form the basis for a valid rejection of claims 4-7, 37-38 and 106 because the references when combined do not teach or suggest all of the claim elements. In addition, there is no suggestion or motivation in Bencher to combine the teachings of Bencher with the combined teachings of Nariani, Jacobs and Wang.

With regard to claim 4, the Examiner states, "Nariani, Jacobs and Bencher are silent to the conformal insulating layer having a thickness in ranging from 20 angstroms to 70 angstroms" (Office Action, page 10, lines 10-12). The Examiner makes a similar admission with regard to claims 37 and 106. (Office Action, page 11, lines 17-18; page 12, lines 6-9). Although Applicants contend the oxide of layer 18/20 of Jacobs is not a conformal insulating layer, Jacobs does disclose the thickness of oxide layer 18/20. Jacobs mentions minimum thicknesses of the oxide layer being 900, 450, 1100 and 900 Angstroms. (Jacobs, col. 5, lines 19-33) These are different orders of magnitude than the thicknesses mentioned in

Wang. Therefore, Jacobs teaches away from combining its teachings with Wang.

Claims 4-7 depend directly or indirectly from claim 3. In addition to the reasons explained above, dependent claims 4-7 are allowable for at least the same reasons for which claim 3 is allowable. Allowance of claims 4-7 is requested.

Claims 37-38 depend from claim 36. In addition to the reasons explained above, dependent claims 37-38 are allowable for at least the same reasons for which claim 36 is allowable. Allowance of claims 37-38 is requested.

Claim 106 depends from claim 103. In addition to the reasons explained above, dependent claim 106 is allowable for at least the same reasons for which claim 103 is allowable. Allowance of claim 106 is requested.

III. Claims 72-73

Claims 72-73 are rejected under 35 U.S.C. §103(a) as being unpatentable over Nariani, Jacobs and Bencher in further view of Jain et al. (USP 5,741,626). (Office Action, page 12, lines 10-12) Applicants respectfully disagree and traverse the § 103(a) rejection.

The combination of Nariani, Jacobs, Bencher and Jain does not form the basis for a valid rejection of claims 72-73 because the references when combined do not teach or suggest all of the claim elements. In addition, there is no suggestion or motivation in Bencher to combine the teachings of Bencher with the combined teachings of Nariani, Jacobs and Jain.

Claims 72-73 depend directly or indirectly from claim 3. In addition to the reasons explained above, dependent claims 72-73 are allowable for at least the same reasons for which claim 3 is allowable. Allowance of claims 72-73 is requested.

IV. Conclusion

In view of the foregoing amendments and remarks, Applicants respectfully

submit that the §103 rejection of claims 3, 8-11, 36, 39, 74 and 102-105 as being unpatentable over Nariani, Jacobs and Bencher should be withdrawn. The §103 rejection of claims 4-7, 37-38 and 106 as being unpatentable over Nariani, Jacobs, Bencher and Wang should be withdrawn. Finally, the §103 rejection of claims 72-73 as being unpatentable over Nariani, Jacobs, Bencher and Jain should be withdrawn. Applicants respectfully submit that the entire application (claims 3-11, 36-39, 72-74, 102-106 are under consideration) is in condition for allowance. Applicants respectfully requests that a timely Notice of Allowance be issued in this case. The undersigned can be contacted at (925) 621-2121 to discuss any aspect of this application.

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